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Assessment of benzene induced oxidative impairment in rat isolated pancreatic islets and effect on insulin secretion

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ARTICLE INFO

Article history:

Received 31 January 2015

Received in revised form

4 April 2015

Accepted 10 April 2015

Available online 20 April 2015

Keywords:

Benzene

Environmental pollutants

Insulin resistance

Oxidative stress

Pancreatic islets

ABSTRACT

Benzene (C₆H₆) is an organic compound used in petrochemicals and numerous other industries. It is abundantly released to our environment as a chemical pollutant causing widespread human exposure. This study mainly focused on benzene induced toxicity on rat pancreatic islets with respect to oxidative damage, insulin secretion and glucokinase (GK) activity. Benzene was dissolved in corn oil and administered orally at doses 200, 400 and 800 mg/kg/day, for 4 weeks. In rats, benzene significantly raised the concentration of plasma insulin. Also the effect of benzene on the release of glucose-induced insulin was pronounced in isolated islets. Benzene caused oxidative DNA damage and lipid peroxidation, and also reduced the cell viability and total thiols groups, in the islets of exposed rats.

In conclusion, the current study revealed that pancreatic glucose metabolism is susceptible to benzene toxicity and the resultant oxidative stress could lead to functional abnormalities in the pancreas.

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1. Introduction

Benzene (C₆H₆) is an organic compound, used as an industrial solvent and a component of petrochemicals. It is one of the environmental contaminants released from various sources affecting human life. Refined petroleum products generally contain benzene 2–3% by volume. But in certain regions of the world, the use of benzene in petrochemicals has reached to more than 5% by volume (Verma and Tombe, 2002; Karakitsios

et al., 2007). Release of benzene in our environment takes place from industrial wastes, combustion of petrochemicals, and cigarette smoke. Its absorption takes place from all natural routes and rapidly metabolized in the liver and bone marrow. And the resultant toxic metabolites and free radicals cause various lethal effects on the body (Travis et al., 1990; Bahadar et al., 2014a).

Free radicals and reactive oxygen species (ROS) have been thought as important physiological mediators playing an

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<http://dx.doi.org/10.1016/j.etap.2015.04.010>

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